Journal of Applied Physics 2004 vol.96 N8, pages 4319-4325

Monte Carlo modeling of spin injection through a Schottky barrier and spin transport in a semiconductor quantum well

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Abstract

A Monte Carlo model was developed for the study of injection of spin-polarized electrons through a Schottky barrier from a ferromagnetic metal contact into a nonmagnetic low-dimensional semiconductor structure. Both mechanisms of tunneling injection and thermionic emissions are included in the model. The third-order term in the momentum for the Dresselhaus interaction is also included along with the linear term. The study of the the effect of Schottky potential on the spin dynamics in a two-dimensional semiconductor device channel showed that the injection current can maintain the substantial spin polarization to a length scale at room temperature without external magnetic fields.

http://dx.doi.org/10.1063/1.1794893